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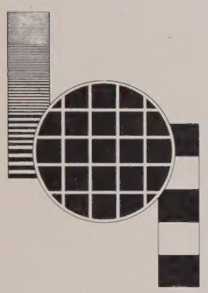

VHF-UHF TV Modulator

PM5524

9449 055 240..

9499 490 07711 731115/2/01/02/03/04

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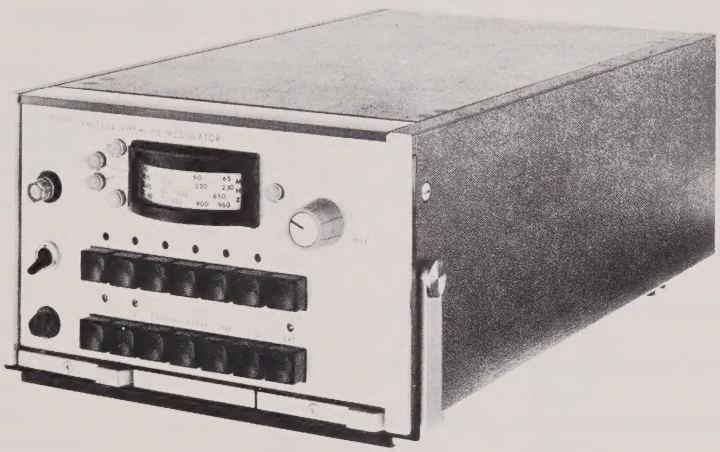

Instruction manual

Important:

In correspondance concerning this instrument, please quote the complete type and serial number, as given on the identification plate at the rear of the instrument.

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Sales and service all over the world

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1 Introduction

GENERAL INFORMATION

The PHILIPS PM 5524 is an all-solid-state television VHF-UHF modulator supplying a modulated vision carrier in the TV bands I, III, IV, V and the vision IF. It is primarily designed for use in conjunction with the PHILIPS PM 5522, video colour test generator and the PHILIPS PM 5520, monochrome test generator.
The instrument has four built-in varicap oscillators, one for every TV band and a crystal controlled oscillator for IF, all supplying a double side band spectrum.

These oscillators can be preset to any frequency in its respective band by means of screw driver control on the frontplate.
Besides, sound information can be added by means of a switchable 5.5 MHz oscillator, which can be FM modulated either internal with 1 kHz or external.
A special feature is the possibility of a remote control of all switching functions, simplifying greatly the use and the lay-out of the test set-up.

II. Technical data

Properties expressed in numerical values with stated tolerances are quaranteed by us. Numerical values without tolerances represent the properties of an average instrument.

A. Frequency ranges

Band I	: 45-65 MHz (M-version 53-85 MHz)
Band III	: 170-230 MHz
Band IV	: 470-650 MHz
Band V	: 600-960 MHz
IF	: 38.9 MHz (X-tal controlled) (M-version 45.75 MHz) (D-version 38.0 MHz) (I-version 39.5 MHz)

B. Video part

Video input A	: 1 V_{p-p} ±6 dB, input impedance 75 Ω
Video input B	: 1 V_{p-p} ±6 dB, input impedance 75 Ω
Frequency response	: 50 Hz - 5 MHz ±0.5 dB (M-version 50 Hz - 4.2 MHz) (D-version 50 Hz - 6 MHz) (I-version 50 Hz - 5.5 MHz)
Rejection filter (switchable)	: 5.5 MHz, –20 dB (M-version 4.5 MHz) (D-version 6.5 MHz) (I-version 6 MHz)

Group delay (switchable)

frequency	pre-correction
1 MHz	: 50 ns ± 25 ns
2 MHz	: 90 ns ± 25 ns
3.75 MHz	: 0 ns ± 25 ns
4.43 MHz	: –170 ns ± 50 ns

Group delay M-version

frequency	pre-correction
0.2-3 MHz	: 0 ns ± 25 ns
3.58 MHz	: –170 ns ± 50 ns

Group delay D-version

frequency	pre-correction
1 MHz	: 50 ns ± 25 ns
2-4 MHz	: 90 ns ± 25 ns
5.0 MHz	: 0 ns ± 25 ns
5.5 MHz	: –50 ns ± 50 ns

Group delay I-version

There is no group delay for the I-version because no equalization is applied.

C. Sound part

Internal modulation	: 1 kHz
Deviation	: 15-50 kHz

External modulation	: 1 V_{rms}, adjustable from +0 to −20 dB (screwdriver control, frontplate) input impedance 600 Ω
Deviation	: 0 - 50 kHz
Frequency range	: 50 Hz - 15 kHz
Pre-emphasis	: 50 μs (M-version 75 μs)
Distortion	: < 1.5 % at 50 kHz deviation (M-version < 1 % at 25 kHz) < 0.5 % at 15 kHz deviation

D. RF output

Spectrum	: double sideband
Sound-video spacing	: 5.5 MHz (M-version 4.5 MHz) (D-version 6.5 MHz) (I-version 6.0 MHz)
Sound-video power ratio	: 1:10
Output voltage	: > 100 mV_{rms} (included sync.)
Attenuator	: max. > −40 dB, continuous
Output impedance	: 75 Ω
Differential gain	: < 5 % } 10 % - 80 % carrier level
Differential phase	: < 3° }

E. Temperature range

Operating conditions	: 0 to +50 °C
Storage conditions	: −30 to +70 °C

F. Power supply

Mains voltage	: 115/230 V ±20 %
Mains frequency	: 48-65 Hz
Power consumption	: 20 W at 230 V
Fuse	: For 115 V range: 400 mA, delayed action For 230 V range: 200 mA, delayed action

G. Mechanical data

Width	: 3/6 module in PHILIPS universal 19" system
Height	: 132 mm (3 units)
Depth	: 435 mm
Weight	: 8 kg (without cabinet)

H. Remote control

In operation when the multiplug is attached.
All front panel switch functions are programmable.
Double line control for presetting in the TV bands and
single line control for the other functions.
Operational by contact closure to ground or a logical circuit.

The levels are	: −1.7 V < LOW < 2.5 V 5.5 V < HIGH < 16 V

III Accessories

With the instrument are supplied:

1 Operating manual
1 Mains flex
4 BNC connectors
2 Extension boards, enabling measurements in the instrument when it is in operation.

N.B.

The PM 5524 is delivered without cabinet.
A 3/6 module cabinet can be ordered with typenumber PM 9713.
A 19" cabinet, in which the PM 5524 fits together with the PM 5522, can be ordered with typenumber PM 9716.

IV Description of the blockdiagram

Push buttons

To obtain the remote programming facility (the multiplug BU5 at the rear) all switching functions are D.C. controlled electronic switches.
These switching circuits, being symbolized in the block diagram as a box with a switch, are specially adapted to the PIT Logical System (PLS). (See chapter VIII "Operating the PM 5524").

Sound part

When the switch SK15 "SOUND MODULATION EXT." is pressed the external sound signals, supplied to BU2 "AF IN", are applied to the input amplifier via the potentiometer R10 "SOUND".
From the input amplifier, which supplies the signal with a 50 μsec pre-emphasis, the sound signal is applied to the "5.5 MHz Sound modulator".
When the switch SK13 "SOUND MODULATION INT." is pressed the external sound signal will be substituted by a signal from the "1000 Hz oscillator".
The "5.5 MHz Sound modulator" is a oscillator, which can be FM modulated by the applied AF signal (frequency sweep ±50 kHz).
The 5.5 MHz sound signal is added in the "Adder" stage to the video signal.

Video part

The generator is supplied with 2 input channels: BU3 "VIDEO A" and BU4 "VIDEO B".
The input signal can be selected by means of the switches SK9 "VIDEO INPUT A" or SK10 "VIDEO INPUT B", controlling the input amplifiers.
The gain of the amplifiers can be adjusted by R8 "VIDEO A" respectively R9 "VIDEO B".
When the switch SK11 "FILTER" is released the video signal is applied directly to the "d.c. restore".
But when SK11 "FILTER" is pressed the video signal is applied via the "EQUALIZER and 5.5 MHz notch filter" to the "d.c. restore".
This filter introduces the specified phase pre-distortion and suppresses possible signals on 5.5 MHz.
The "d.c. restore" is clamping the sync top to a fixed d.c. level by means of the line pulses obtained from the "Sync separator".
In the adder stage the video signal is added to the 5.5 MHz sound signal.

RF oscillators and modulator

The "Modulator", which is supplied with the video signal with 5.5 MHz sound and a RF signal, is supplying a double side band signal to the output connector BU1 "RF OUT".
The oscillator for the IF frequency is X-tal controlled.
The oscillators, which cover respectively bands I, III, IV and V are frequency controlled by varicap diodes.
The voltages of the diodes are adjusted by the potentiometers R2 – R7 in unit 6.
The "Frequency meter", which is also supplied with the voltage of the potentiometers, is calibrated to the frequency obtained from the RF oscillators.
The oscillators and the potentiometers are switched on by the switches SK2 – SK7.
The switches are controlling the oscillators via a matrix system.
The "Matrix" can be wired in accordance with local wishes (see chapter VII-C).

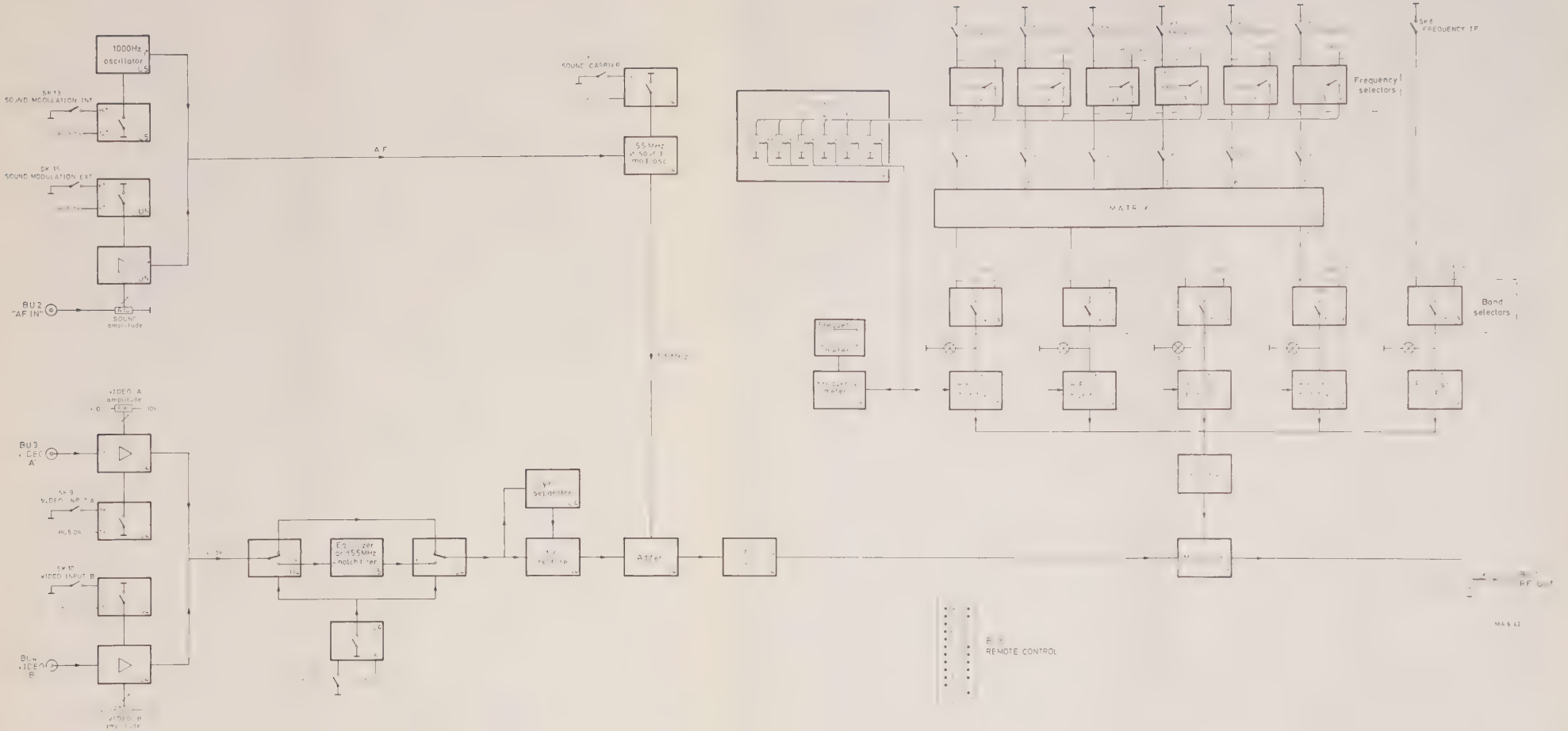


Fig. IV-1. Blockdiagram

V Installation

A. Adjusting to the local mains voltage

The instrument can be used with mains voltages of 115 V and 230 V, ±20 %.
Before installation check the adjustment.
If the instrument has to be adjusted to another mains voltage resolder the connections to the primary windings of the mains transformer as shown in the figure below.

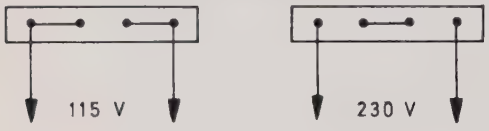


Fig. V-1. Adjusting to the local mains voltage

B. Earthing

Earth the instrument according to the local safety regulations.
The instrument can be earthed via BU6 or via the earthing core of the mains flex.

N.B.

To avoid destroying of the semi-conductions in the modulator, interconnect the chassis of the TV set with the common of the PM 5524, while the TV set is connected to the mains via an isolating transformer.

C. Mounting in a cabinet

The instrument can be mounted in a 3/6 module cabinet PM 9713.
The PM 5524 fits, together with PM 5522, in a 19" cabinet.
The mounting instructions are delivered with the cabinets.

VI Survey of controls and sockets

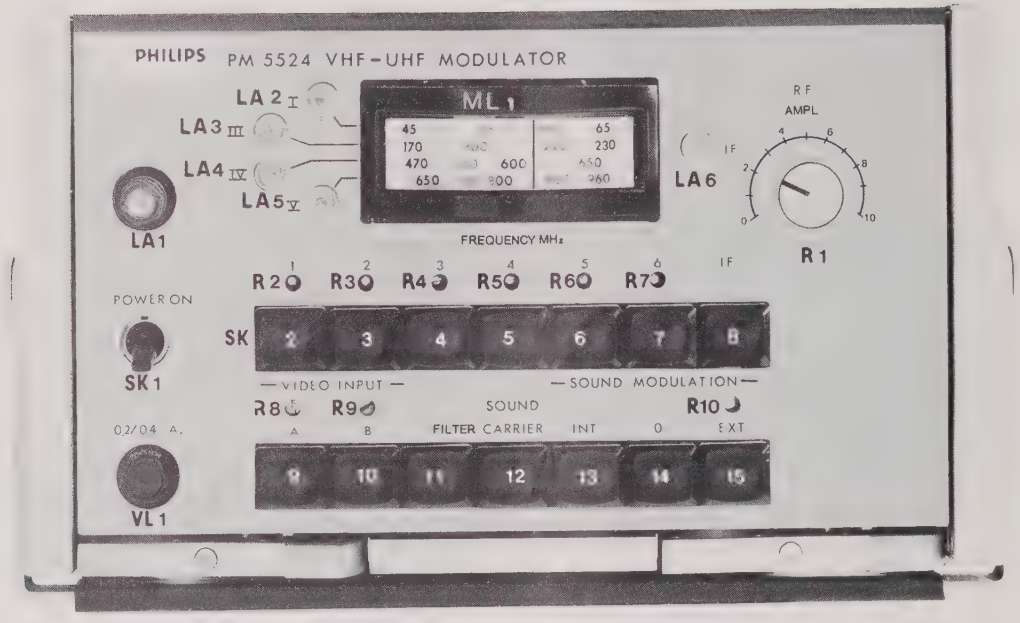


Fig. VI-1. Front of the instrument

A. Front of the instrument

LA1 Pilot lamp: lights up when the instrument is switched on.

LA2, LA3 LA4, LA5 TV band indicator: lights up when the respective TV band is in operation.

LA6 IF indicator: lights up when the vision carrier is supplied on IF basis.

M1 Frequency meter: indicates on which frequency the vision carrier is supplied.

VL1 Safety fuse: 230 V - 200 mA, delayed action type;
115 V - 400 mA, delayed action type.

SK1 "POWER ON"
Mains switch: the instrument is switched on if the lever of the switch is placed upwards.

SK2 – SK7 TV band selectors: each push button selects a TV band.

At delivery: SK2, SK3 → band V
SK4 → band IV
SK5 → band III
SK6, SK7 → band I

This can be modified by internal resoldering.

SK8 IF selector: when pressed the instrument supplies the IF vision carrier.

SK9 "VIDEO INPUT A"
When pressed the video signal applied to BU3 "VIDEO A" will be available on a RF basis at BU1 "RF OUTPUT".

SK10 "VIDEO INPUT B"
When pressed the video signal applied to BU4 "VIDEO B" will be available on a RF basis at BU1 "RF OUT".

SK11 "FILTER"
When pressed a 5.5 MHz rejection filter plus a group delay pre-distortion filter will be switched in the video signal.

SK12 "SOUND CARRIER"
When pressed the sound carrier is added to the vision carrier.

SK13 "SOUND MODULATION INT."
When pressed the sound carrier is internal modulated with 1 kHz.

SK14 "SOUND MODULATION 0".
When pressed the sound carrier will not be modulated.

SK15 "SOUND MODULATION EXT."
When pressed the sound carrier will be modulated with an audio signal applied to BU2 "AF IN".

R1 "RF AMPL."
continuous attenuator, controlling RF output voltage.

R2...R7 Potentiometer for pre-setting the frequency of the vision carrier in the TV band selected by the respective push button (SK2...SK7).

R8 Potentiometer, adjusting the applied video signal A by ±6 dB.

R9 Potentiometer, adjusting the applied video signal B by ±6 dB.

R10 Potentiometer, adjusting the applied sound signal from +0 to −20 dB.

B. Rear of the instrument

BU1 "RF OUT – 75Ω".
Output socket for the composite RF signal.

BU2 "AF IN – 600Ω".
Input socket for an external audio signal if SK15 is pressed.

BU3 "VIDEO A – 75Ω".
Input socket for an external video signal if SK9 is pressed.

BU4 "VIDEO B – 75Ω".
Input socket for an external video signal if SK10 is pressed.

BU5 "REMOTE CONTROL".
Multiplug to facilitate a remote programming of the instrument. The modulator is switched over to remote programming when pin 23 is connected to pin 24 of the 24-pole multiplug (see chapter VII-8).

BU6 "⏚".
Earth terminal: common earth for electrical circuits and metal cabinet.

BU7 Mains socket.

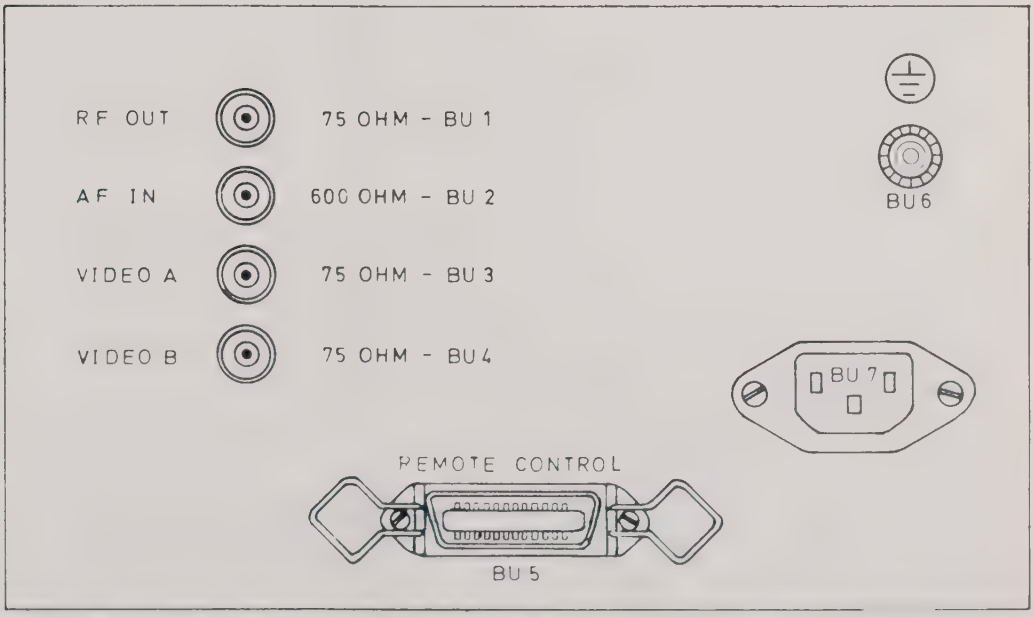


Fig. VI-2. Rear of the instrument

VII Operating the PM 5524

A. Manipulations

- Apply a video signal to BU3 and/or BU4 and select the video input by means of SK9 or SK10.
- The video signal should be 1 V_{p-p} for 100 % modulation (10 % rest carrier).
  Slight differences can be adjusted by means of potentiometer R8 or R9 (frontplate).
- Select the TV band by means of the push buttons SK2...SK7 or IF by means of SK8 (respective indicator lights up).
- Preset to the required frequency by means of the respective potentiometer R2...R7.
- When a group delay pre-distortion of the video signal is required, press SK11; at the same time a 5.5 MHz rejection filter is switched in the video signal to avoid any influence between the 5.5 MHz sound carrier and 5.5 MHz harmonics in the video signal.
- A sound carrier can be added to the vision carrier by pressing SK12.
- This sound carrier can be added unmodulated (SK14), internally modulated with 1 kHz (SK13) or externally modulated with an audio signal applied to BU2 (SK15).
- Adjust the RF output voltage to the required level by means of R1 (RF AMPL).

B. Remote programming

If the instrument has to be remote-controlled connect the modulator with the remote control unit by means of the multiplug at the rear.
The "internal-remote" switch is activated by interconnecting pin 23 with pin 24 of the multiplug.
The other numbers of the pins have been matched to the several functions of the modulator.
A certain function is put in operation by connecting the corresponding pin of the multiplug to common.
However, for selecting a carrier frequency in one of the TV bands, two pins should be connected to common. Viz. on to select a TV band and the other a potentiometer, pre-setting the frequency (see Fig. VII-1).

C. Selecting a TV band

The four TV bands are selected by means of the six push buttons SK2 – SK7.
Each push button switches in one varycap oscillator and the potentiometer, situated just above the respective push button, for presetting the frequency.
Which TV band is switched in is dependent on the matrix in unit 3. (see also Fig. VII-2).

At delivery: SK2, SK3 → band V
SK4 → band IV
SK5 → band III
SK6, SK7 → band I

The matrix can easily be modified by resoldering the links.

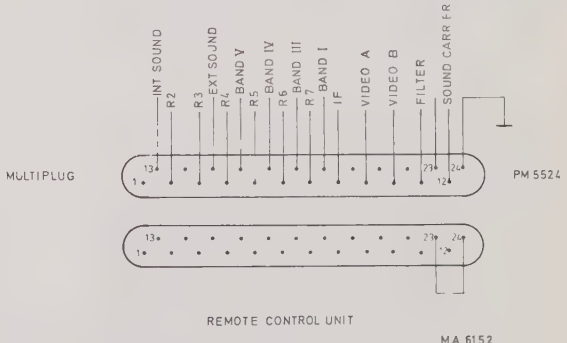


Fig. VII-1. Multiplug remote control

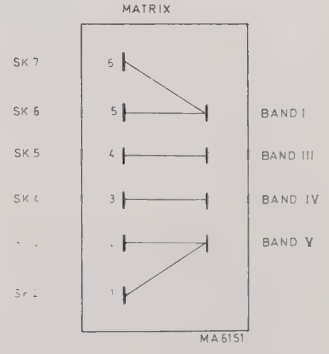


Fig. VII-2. Matrix

VIII. Checking and adjusting

The unit to be checked or adjusted, should be placed on an "Extension board", delivered with the instrument.
The tolerances mentioned are factory tolerances which apply when readjusted the instrument.
They may differ from those shown in section "General information chapter II Technical data".
The instrument should have been switched on for more than 15 minutes before checking and adjusting are carried out.

Below a survey of adjusting elements is stated, enabling to make some adjustments without using the extension board.

NP. Switch off the mains when exchanging printed wiring boards.

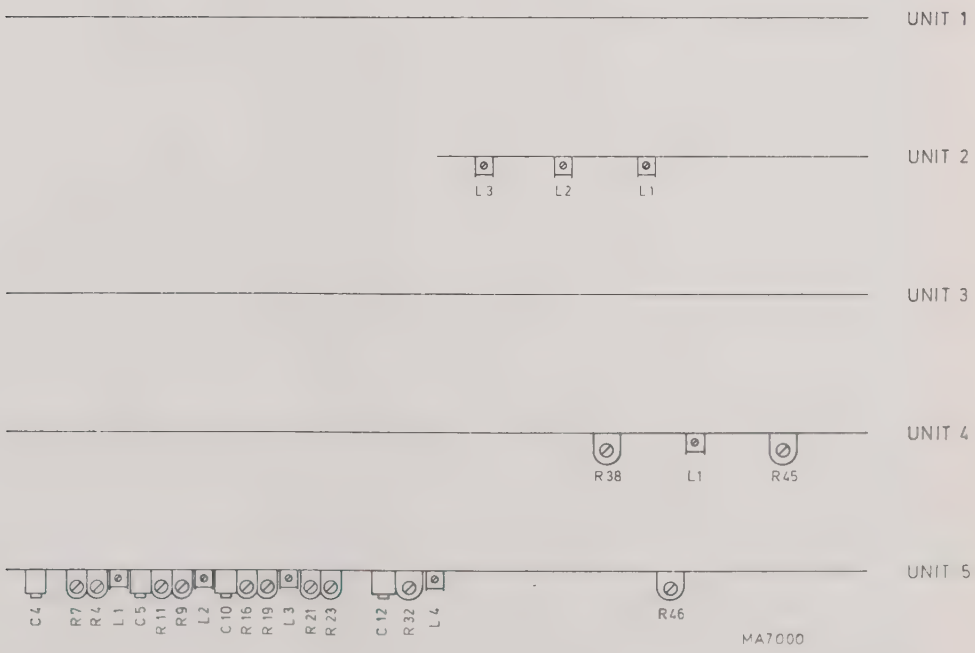


Fig. VIII-1. Adjusting survey

Unit 1. Power supply

Measuring equipment	:
D.c. voltmeter	: e.g. PHILIPS PM 2400
Oscilloscope	: e.g. PHILIPS PM 3250

+10 V d.c.

Connect the voltmeter to terminal 2* (erath at terminal 10*).
The voltage should be +10 V ±0.1 V.
If not readjust R15.

−10 V d.c.

Connect the voltmeter to terminal 19* (earth at terminal 10*).
The voltage should be −10 V ±0.1 V.
If not readjust R25.

The ripple voltages

Connect the oscilloscope to terminals 2*, 19* and 22 (earth at terminal 10*), (viz. +10 V, −10 V and +30 V).
The ripple voltage must not exceed 1 mV_{p-p}.

Unit 2. RF-oscillators

Measuring equipment	:
D.c. voltmeter	: e.g. PHILIPS PM 2400
Counter 0-1000 MHz	: e.g. PHILIPS PM 6630 + PM 6632
RF voltmeter	: e.g. PHILIPS PM 2404 + HF probe PM 9200

The RF oscillator - band IF

Turn R1 "RF AMPL" at max.
Press SK8 "IF".
Connect the counter to terminal 2.
The frequency should be 38900 ±1 kHz (I: 39.5 MHz, M: 45.75 MHz, D: 38.00 MHz).

In case of inserting a new crystal the following adjustment must be carried out.
Put the ironcore of L3 to max. L (completely inside the coil).
Connect the RF voltmeter to terminal 2.
Turn the core to the left and adjust the voltage as shown in Fig. VIII-2.
Switch the instrument on and off several times to be sure that the oscillator starts properly.

The RF oscillator - band I

Turn R1 "RF AMPL" to max.
Press SK7.
Connect the counter to terminal 2.
When turning R7 from left to right the frequency should vary from 45 MHz to 65 MHz (M version 53 - 85 MHz).
If not readjust L2.

The RF oscillator - band III

Turn R1 "RF AMPL" to max.
Press SK5.
Connect the counter to terminal 2.
When turning R5 from left to right the frequency should vary from 170 MHz to 230 MHz.
If not readjust L1.

The RF oscillator - band IV

Turn R1 "RF AMPL" to max.
Press SK4.
Connect the counter to terminal 2.
When turning R4 from left to right the frequency should vary from 470 MHz to 650 MHz.

The RF oscillator - band V

Turn R1 "RF AMPL" to max.
Press SK2.
Connect the counter to terminal 2.
When turning R2 from left to right the frequency should vary from 650 MHz to 960 MHz.

Unit 4. Video amplifier

Measuring equipment	:
D.c. voltmeter	: e.g. PHILIPS PM 2400
Counter	: e.g. PHILIPS PM 6630
Oscilloscope	: e.g. PHILIPS PM 3250

The d.c. level

Release all push buttons.
Connect the voltmeter to terminal 4*.
The voltage should be +500 mV ±10 mV.
If not readjust R38.

The sound oscillator-frequency

Press SK12 "SOUND CARRIER".
Press SK14 "SOUND MODULATION 0".
Connect the AC input of the counter to terminal 4*.
Terminate the counter with 75 Ω.
The frequency should be 5500 kHz ±0.5 kHz (I: 6 MHz, M: 4.5 MHz, D: 6.5 MHz).
If not readjust L1.

The sound carrier amplitude

Press SK12 "SOUND CARRIER".
Press SK14 "SOUND MODULATION 0".
Connect the oscilloscope to terminal 4*.
Terminate the oscilloscope with 75 Ω.
The voltage should be 600 mV_{p-p} ±10 mV_{p-p}.
If not readjust R45.

The correct videoamplification (R8/R9)

Apply the decided videosignal (between 0.5 - 2 V_{p-p}) to BU3 "VIDEO A".
Press SK8 "IF" and SK9 "VIDEO INPUT A".
Connect the oscilloscope to BU1 "RF OUT".
Terminate with 75 Ω.
Adjust R8 until the restcarrier in the white parts of the outputsignal is 15 %.
The same adjustments should be carried out for "VIDEO INPUT B".

Unit 5. Equalizer and sound

Measuring equipment	:
TV pattern generator	: e.g. PHILIPS PM 5520
Oscilloscope	: e.g. PHILIPS PM 3250
RF generator	: e.g. PHILIPS PM 5321
Sweep generator	: e.g. ROHDE & SCHWARZ VIDEOSHOP III
Group delay meter	: e.g. ROHDE & SCHWARZ
Modulation meter	: e.g. RADIOMETER AFM2

The internal sound frequency deviation

Press SK13 "SOUND INT" and SK12 "SOUND CARRIER".
Connect the modulation meter to terminal 4* on the video amplifier.
The deviation should be 50 kHz ±0.5 kHz (M: 25 kHz ±0.5 kHz).
If not readjust R47.

The notch filter resonance

Press SK11 "NOTCH FILTER".
Connect the RF generator to terminal 6.
Connect the oscilloscope to terminal 3.
Switch the RF generator into position 4 MHz unmodulated - 1 V_{p-p}.
Note the signal amplitude at the oscilloscope.
Shift the frequency from 4 MHz to 5.5 MHz.
(I version: from 4.5 MHz to 6 MHz, M version: from 3 MHz to 4.5 MHz, D version: from 5 MHz to 6.5 MHz).
The signal should decrease at least 20 db.
If not readjust L4 for min. signal on the oscilloscope.

The correct deviation at ext. sound modulation (R10)

Apply the desired sound signal to BU2 "AF IN".
Press SK12 "SOUND CARRIER" and SK15 "SOUND MODULATION EXT".
Connect the modulation meter to terminal 4* at unit 4 - video amplifier.
Adjust R10 until the deviation is 50 kHz ±0.5 kHz (M: 25 kHz ±0.5 kHz).

Equalizer amplification

Press SK9 "VIDEO INPUT A".
Connect the TV pattern generator to BU3.
Switch the generator into pos. Chequer board.
Connect the oscilloscope to terminal 3.
Switch the "FILTER" on and off by means of SK11.
The amplitude of the signal must not change more than 1 %.
If necessary readjust R32.

The following sections: Equalizer ampl. and group delay response merely serve as information.
In case of incorrectly adjusted or defective equalizer we recommand to return the unit for service in Copenhagen.
After service the amplification of the equalizer must be checked or adjusted, see section "Equalizer amplification".

The equalizer amplitude response

Press SK11 "FILTER".
Connect the sweepgenerator to terminal 6.
Connect the oscilloscope to terminal 3.
The amplitude response should keep the tolerances shown in Fig. VIII-3G-3M-3D-3I.
If not readjust R7-R9-R19-R21-C4-C5-C10-C12 where the adjustment elements are in connection with

TS1 adjusts amplitude response ab. 4 MHz
TS2 adjusts amplitude response ab. 3 MHz
TS3 adjusts amplitude response ab. 2 MHz
TS4 adjusts amplitude response ab. 1 MHz

For the G version.

The equalizer group delay response

Press SK11 "FILTER".
Connect the oscilloscope, the sweep generator and the group delay meter to terminal 3 resp. 6.
The group delay response should keep the tolerances shown in Fig. VIII-4G-4M-4D.
If not readjust R4, R11, R16 and R23.

The adjustment elements are in connection with:

TS1 adjusts group delay response ab. 4 MHz
TS2 adjusts group delay response ab. 3 MHz
TS3 adjusts group delay response ab. 2 MHz
TS4 adjusts group delay response ab. 1 MHz

For the G version.

Unit 7. Modulator

Measuring equipment :

Oscilloscope : e.g. PHILIPS PM 3250

AF generator : e.g. PHILIPS PM 5145

The modulator balance

Press SK8 "IF".
Turn R1 "RF OUTPUT" to "MAX".
Connect the Y input of the oscilloscope to BU1 "RF OUT".
Terminate the oscilloscope with 75 Ω.
Disconnect the lead to terminal 3 of the modulator.
Connect the AF generator to terminal 3.
Switch the AF generator into pos. 400 Hz - 1 V_{p-p}.
Supply the same signal to the X input of the oscilloscope.

The modulator balance can now be checked (see Fig. VIII-5).
In case of more unbalance than stated the modulator unit must be replaced.

NB. When soldering on the terminals of the modulator the metal of the soldering iron must be grounded.

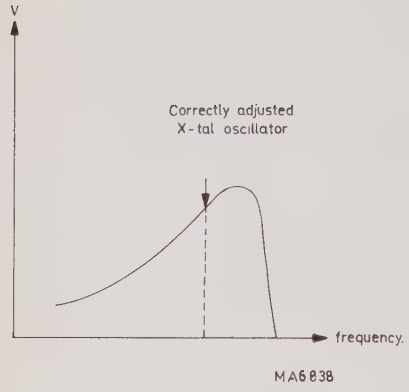


Fig. VIII-2. IF frequency response

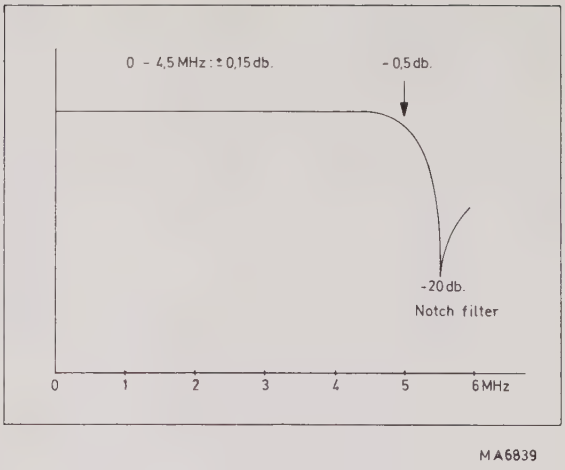


Fig. VIII-3G. Amplitude response G version

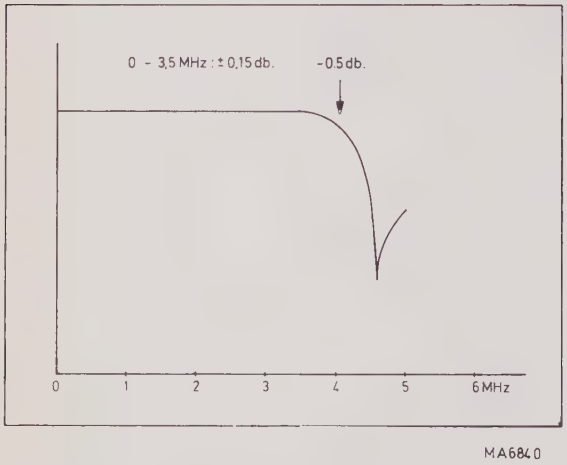


Fig. VIII-3M. Amplitude response M version

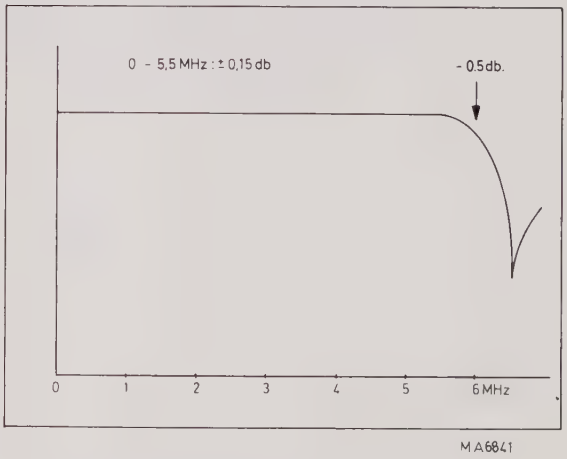


Fig. VIII-3D. Amplitude response D version

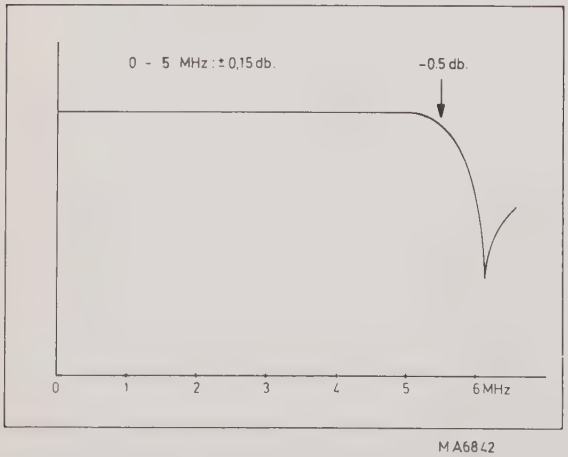


Fig. VIII-3I. Amplitude response I version

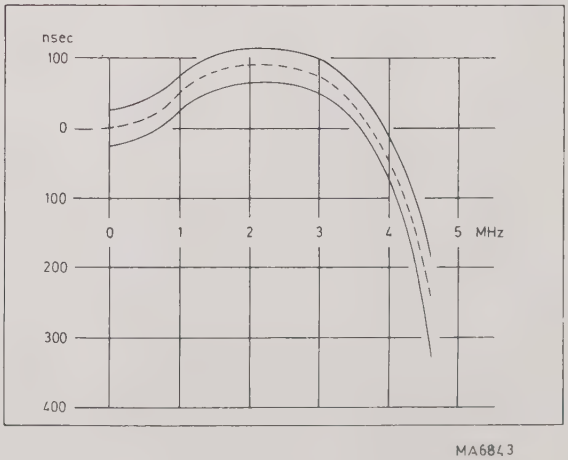


Fig . VIII-4G. Groupdelay response G version

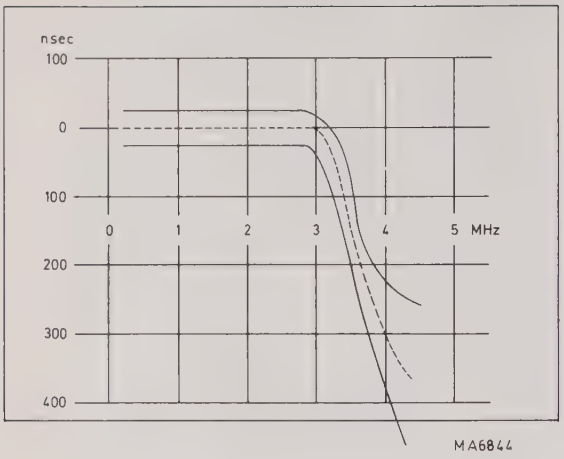


Fig. VIII-4M. Groupdelay response M version

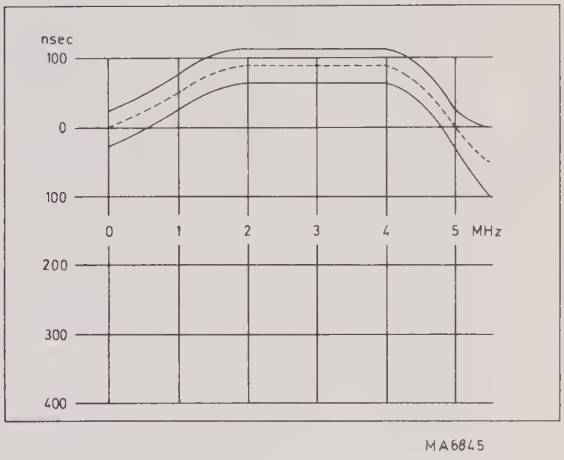
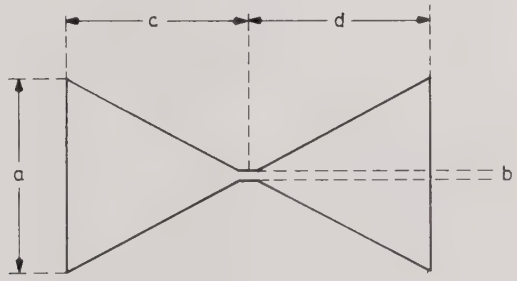


Fig. VIII-4D. Groupdelay response D version



b : < 2% a

c = d

MA6846

Fig. VIII-5. Amplitude response of modulator balance

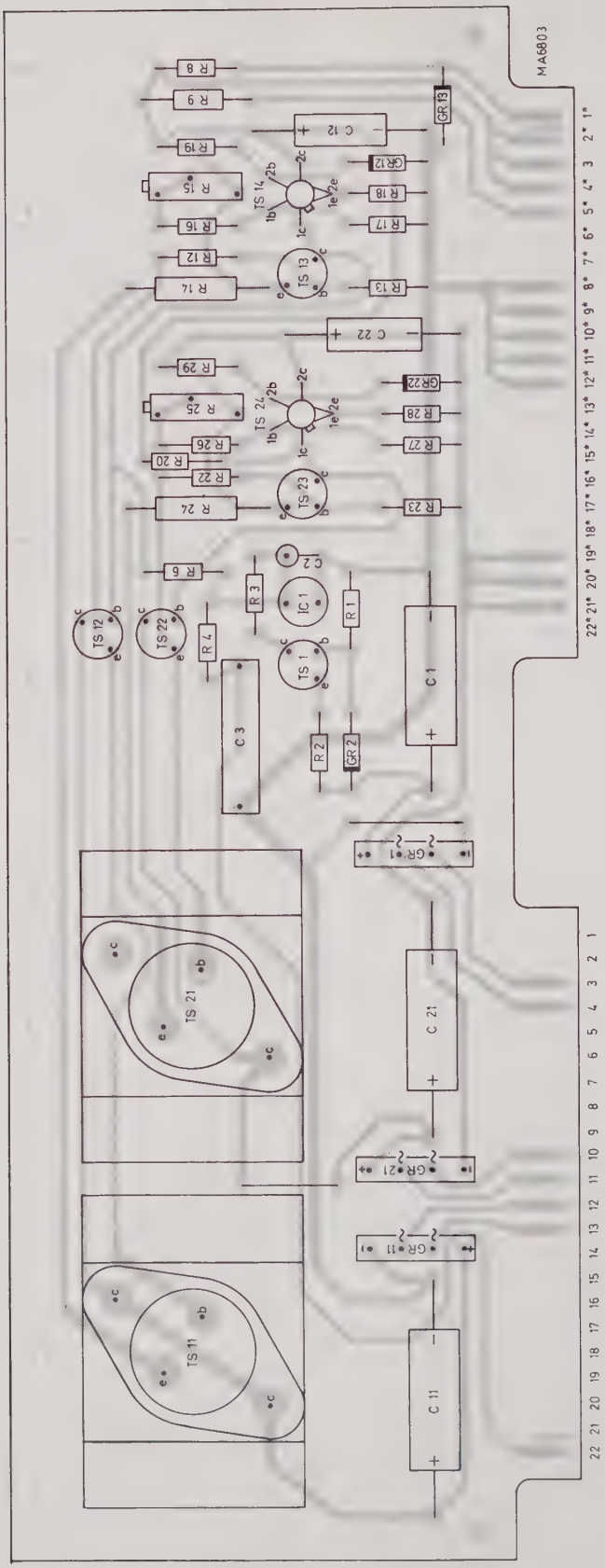


Fig. IX-1. Printed wiring board, power supply, unit 1

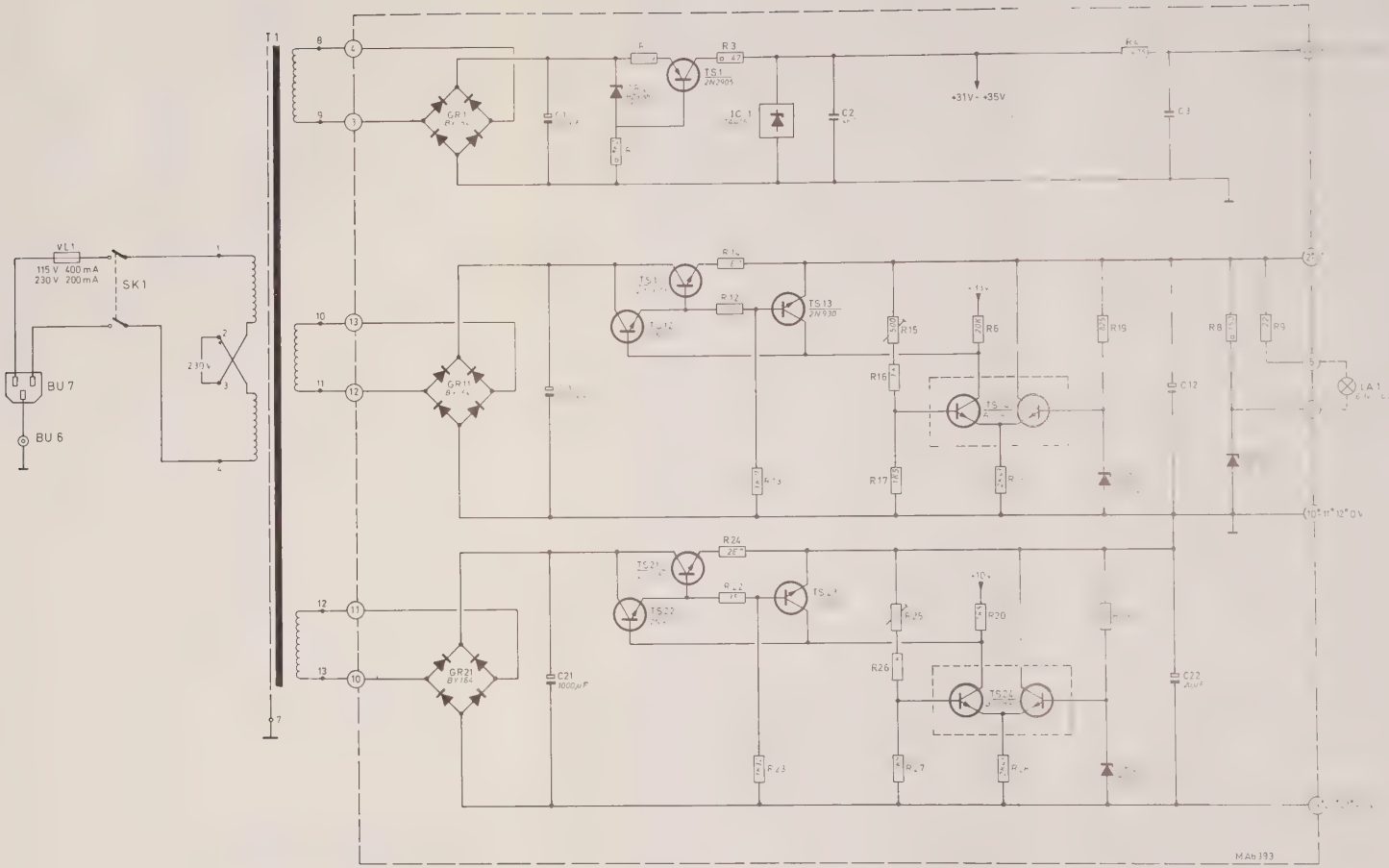


Fig. IX-1a. Circuit diagram, power supply, unit 1

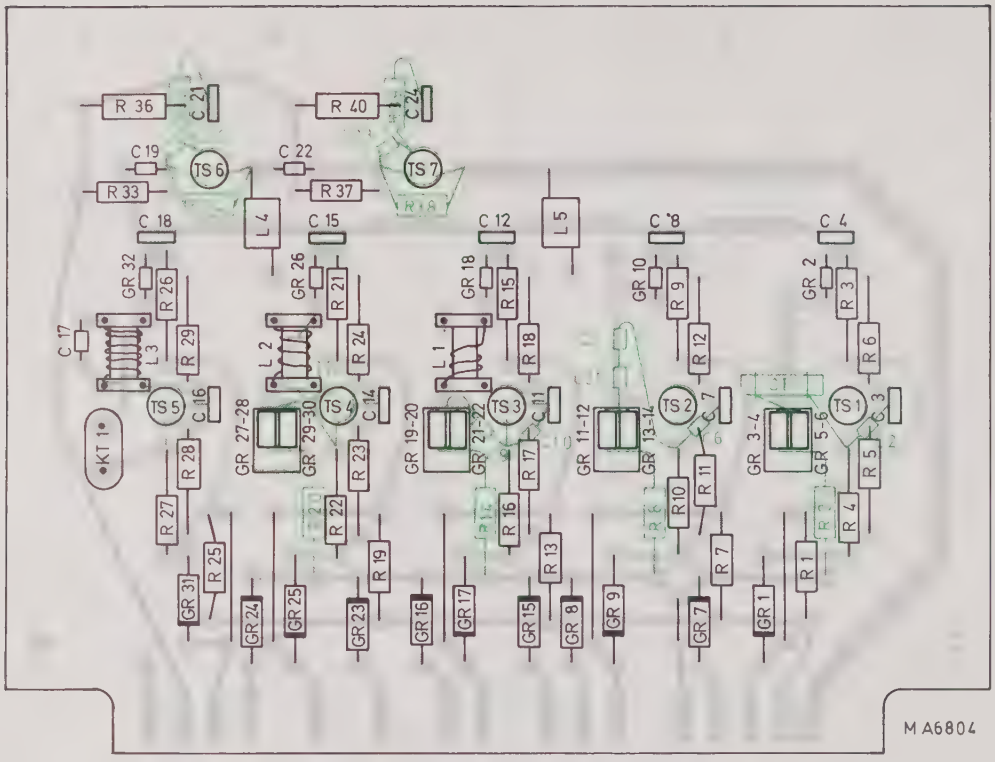
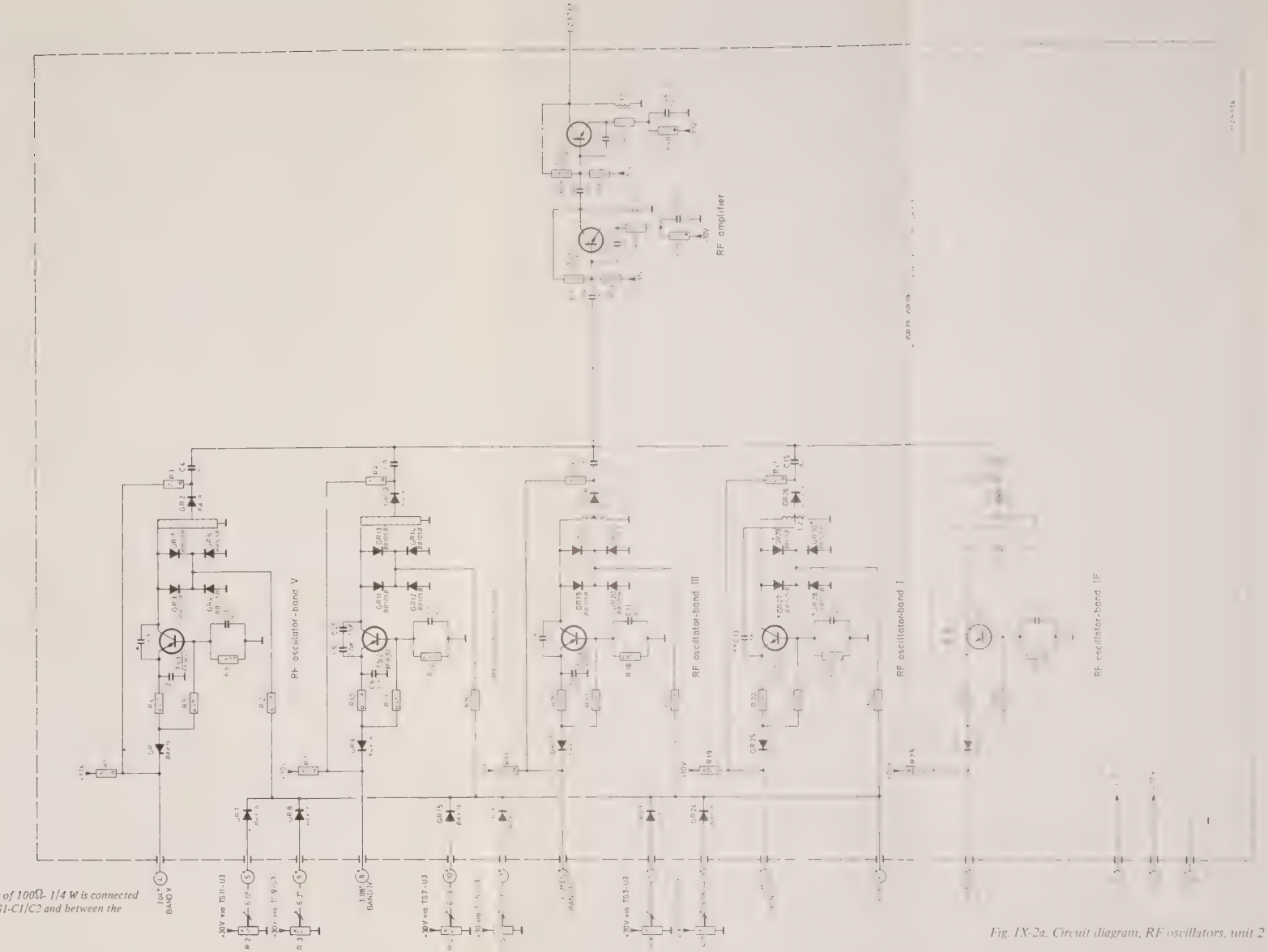


Fig. IX-2. Printed wiring board, RF oscillator, unit 2



Erratum:

In 02/03 version a resistor of 100Ω- 1/4 W is connected between the emittor of TS1-C1/C2 and between the emittor of TS2-C5/C6.
R35-R39 = 15Ω

Fig. IX-2a. Circuit diagram, RF oscillators, unit 2

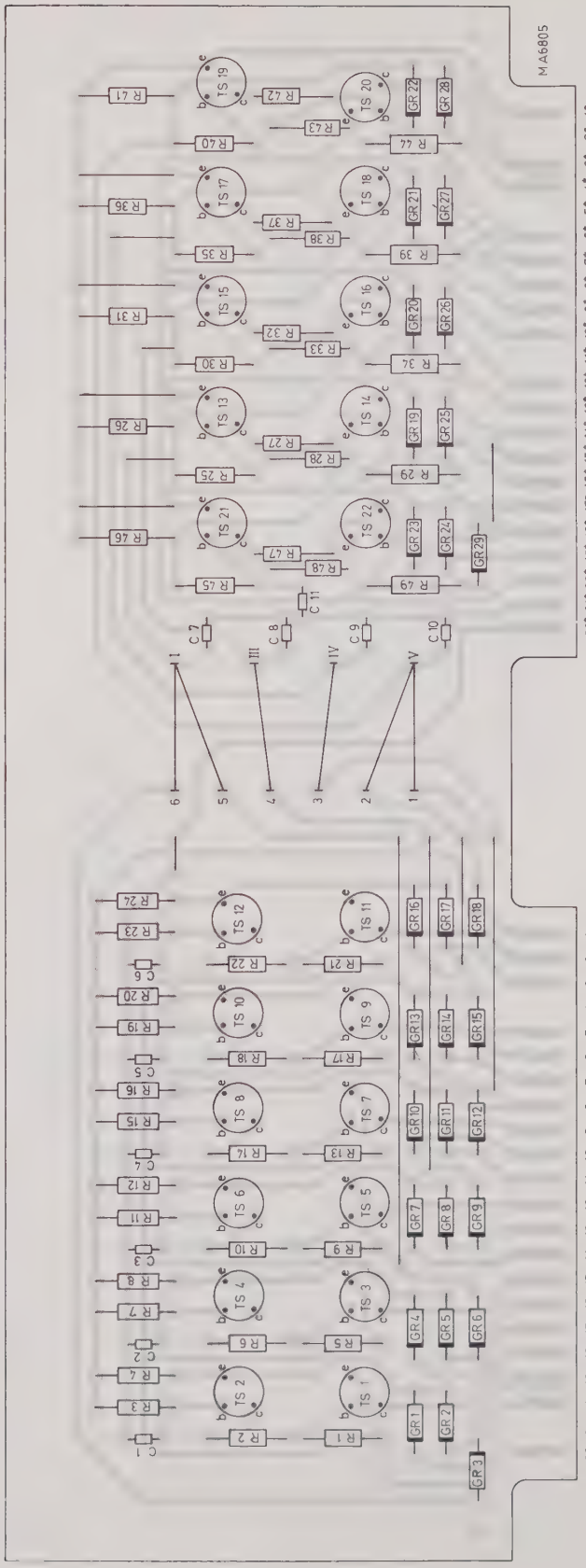


Fig. IX-3. Printed wiring board, control gates, unit 3

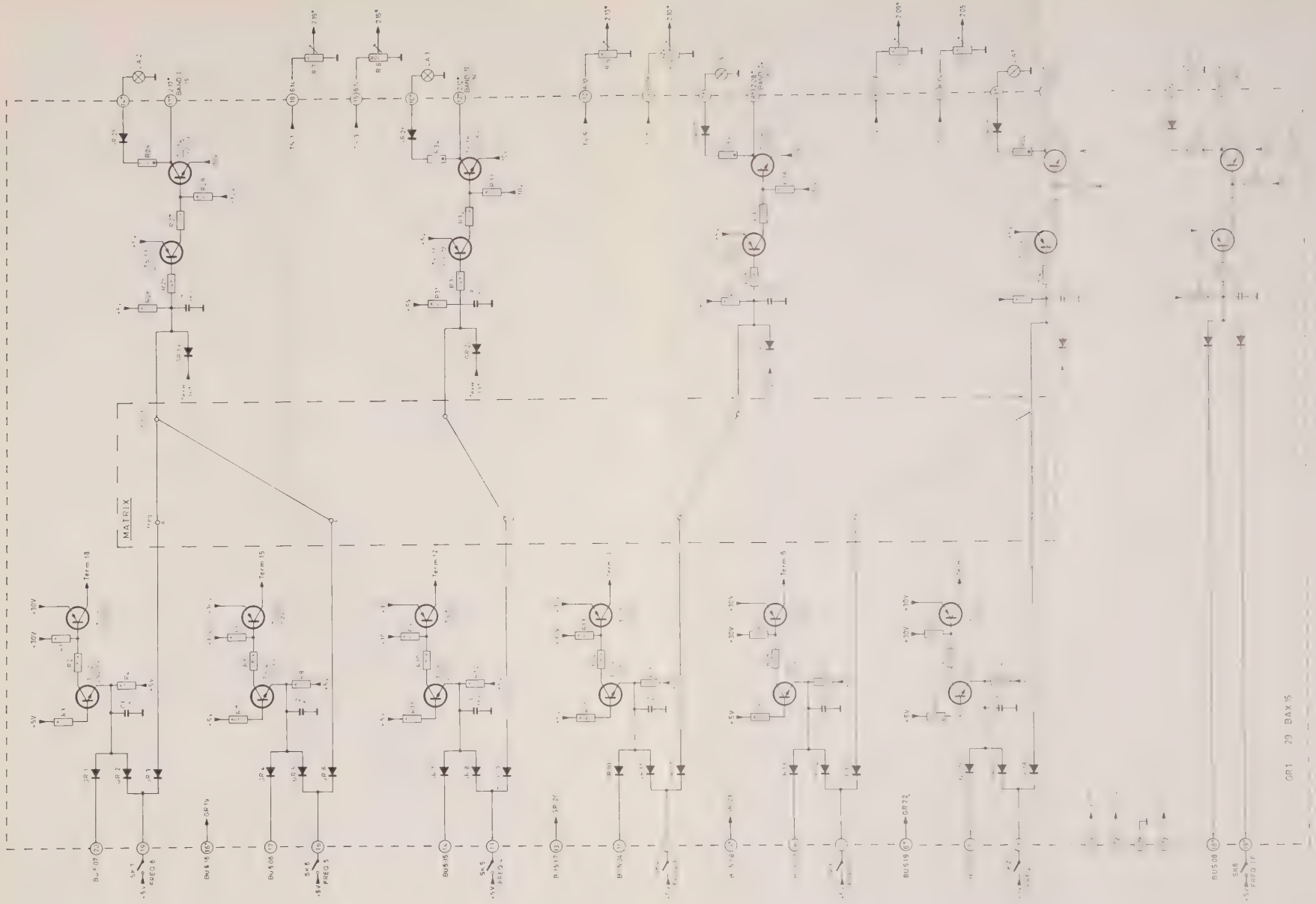


Fig. IX-3a. Circuit diagram, control gates, unit 3

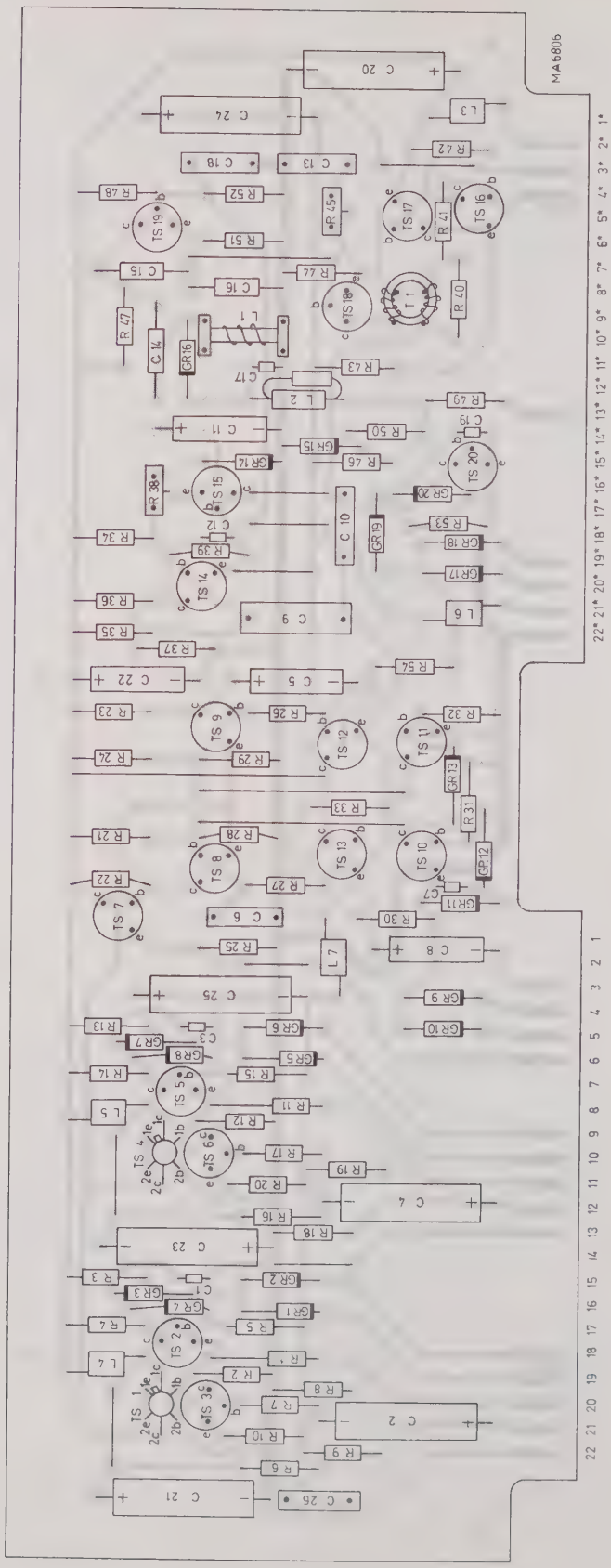


Fig. IX-4. Printed wiring board, video amplifier, unit 4

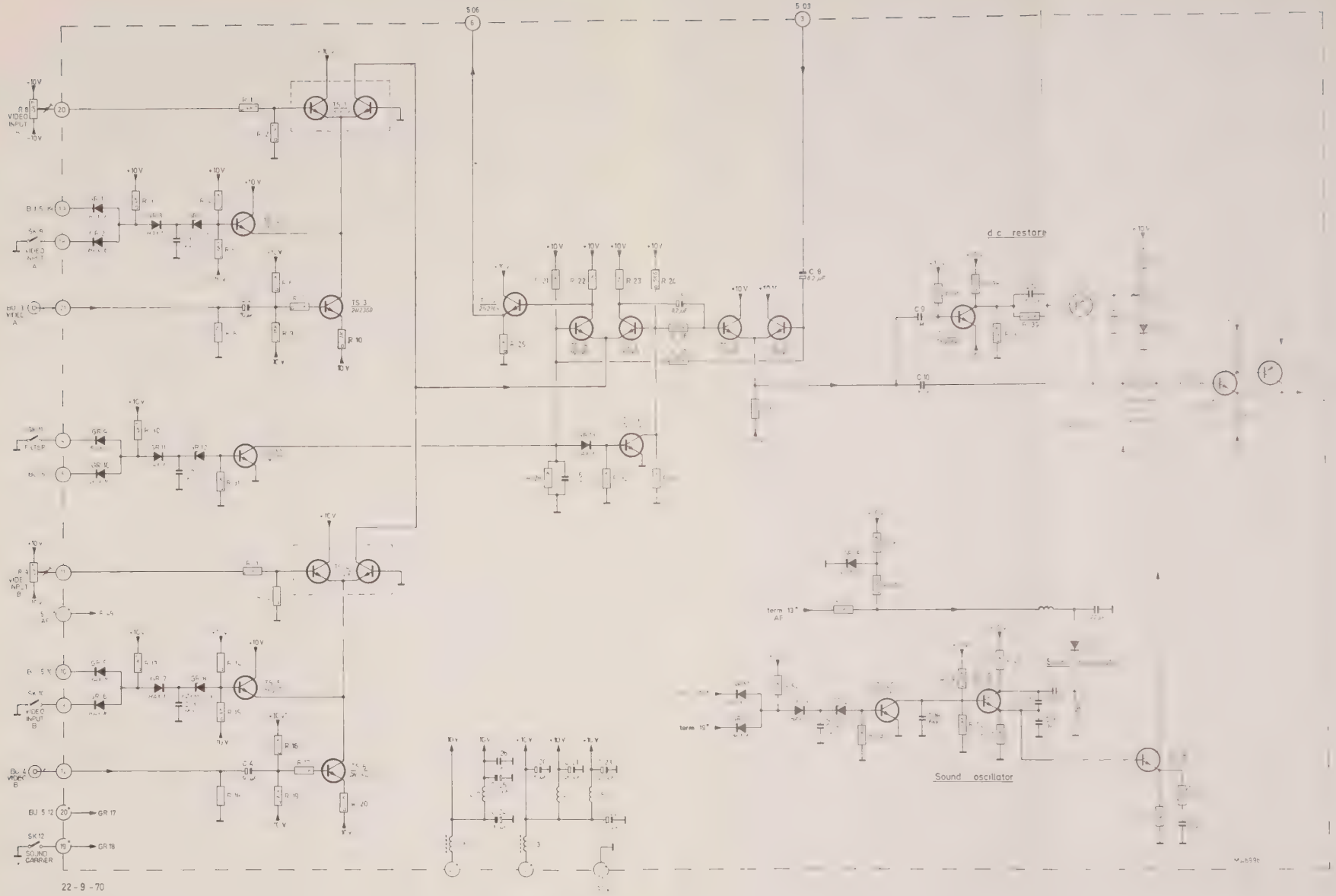


Fig. IX-4a. Circuit diagram, video amplifier, unit 4

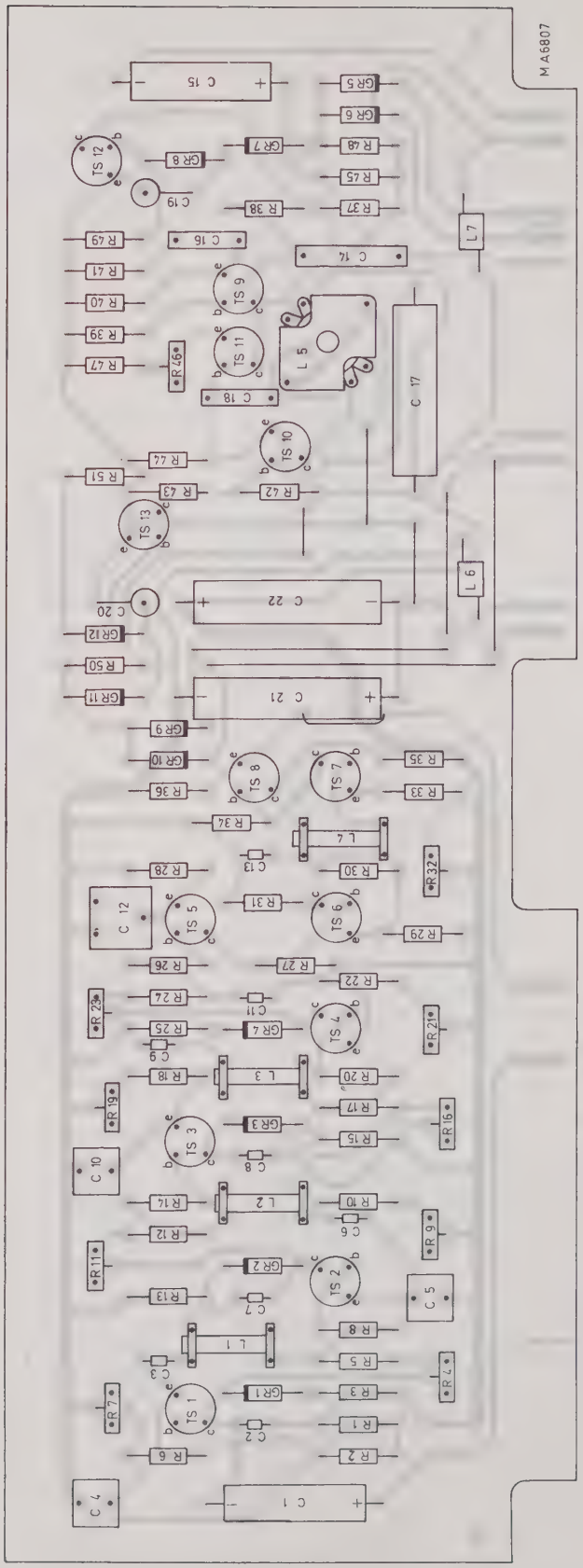


Fig. IX-5. Printed wiring board, equalizer and sound, unit 5

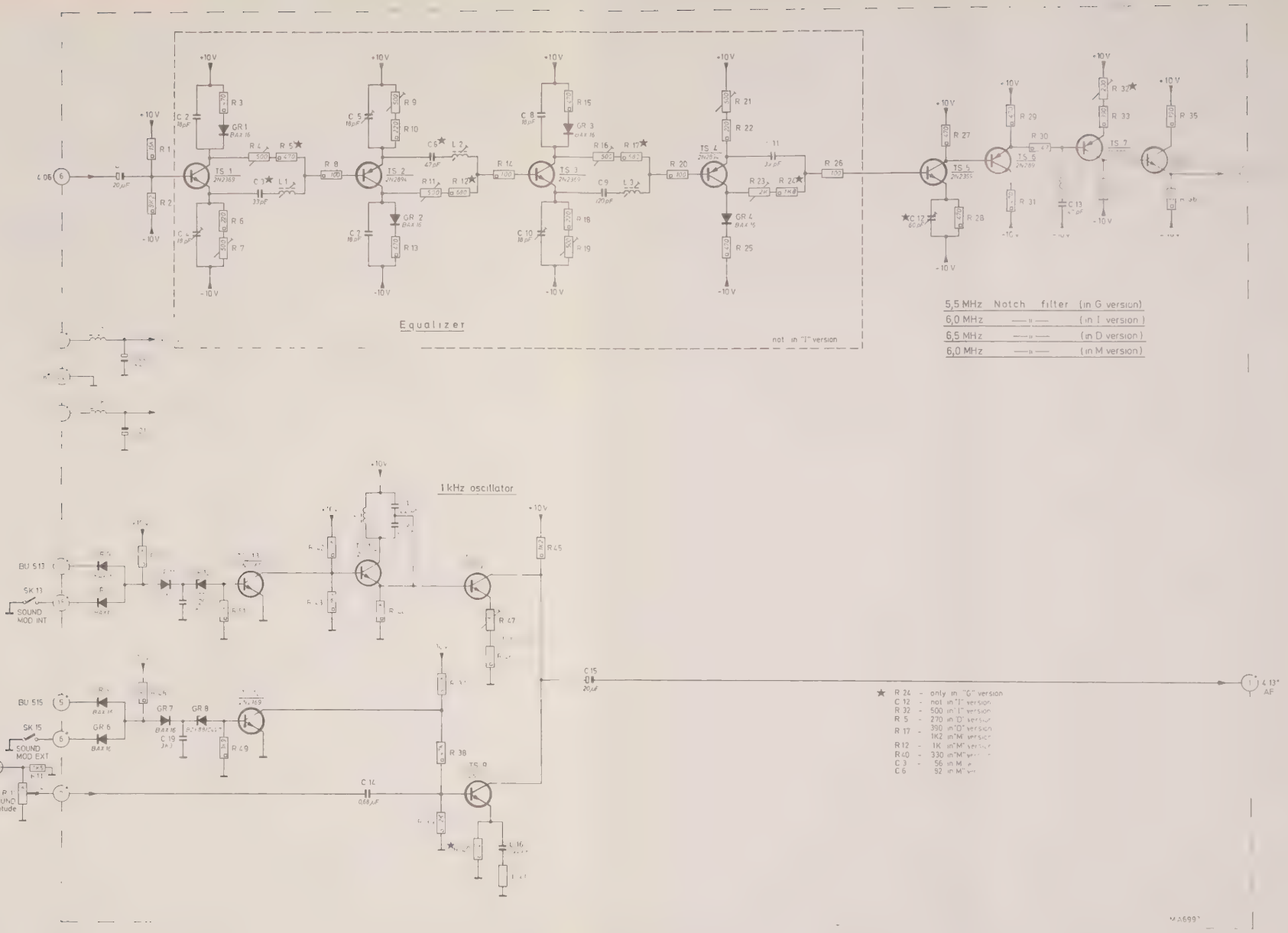

Equalizer
not in "I" version
1 kHz oscillator
5,5 MHz Notch filter (in G version)
6,0 MHz —"— (in I version)
6,5 MHz —"— (in D version)
6,0 MHz —"— (in M version)
SOUND MOD INT
SOUND MOD EXT
SOUND amplitude
★ R 24 - only in "G" version
C 12 - not in "I" version
R 32 - 500 in "I" version
R 5 - 270 in "D" version
R 17 - 390 in "D" version
1K2 in "M" version
R 12 - 1K in "M" version
R 40 - 330 in "M" version
C 3 - 56 in M...
C 6 - 92 in M...

Fig. IX-5a. Circuit diagram, equalizer and sound, unit 5

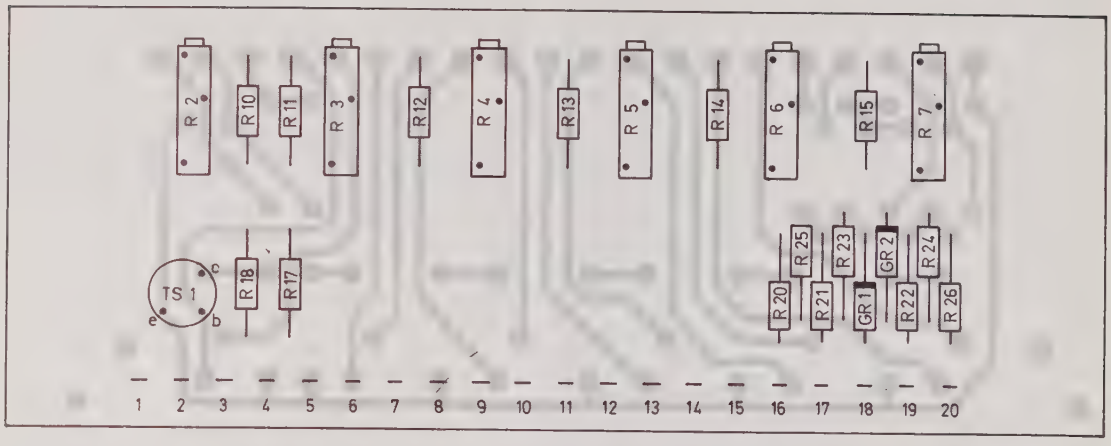
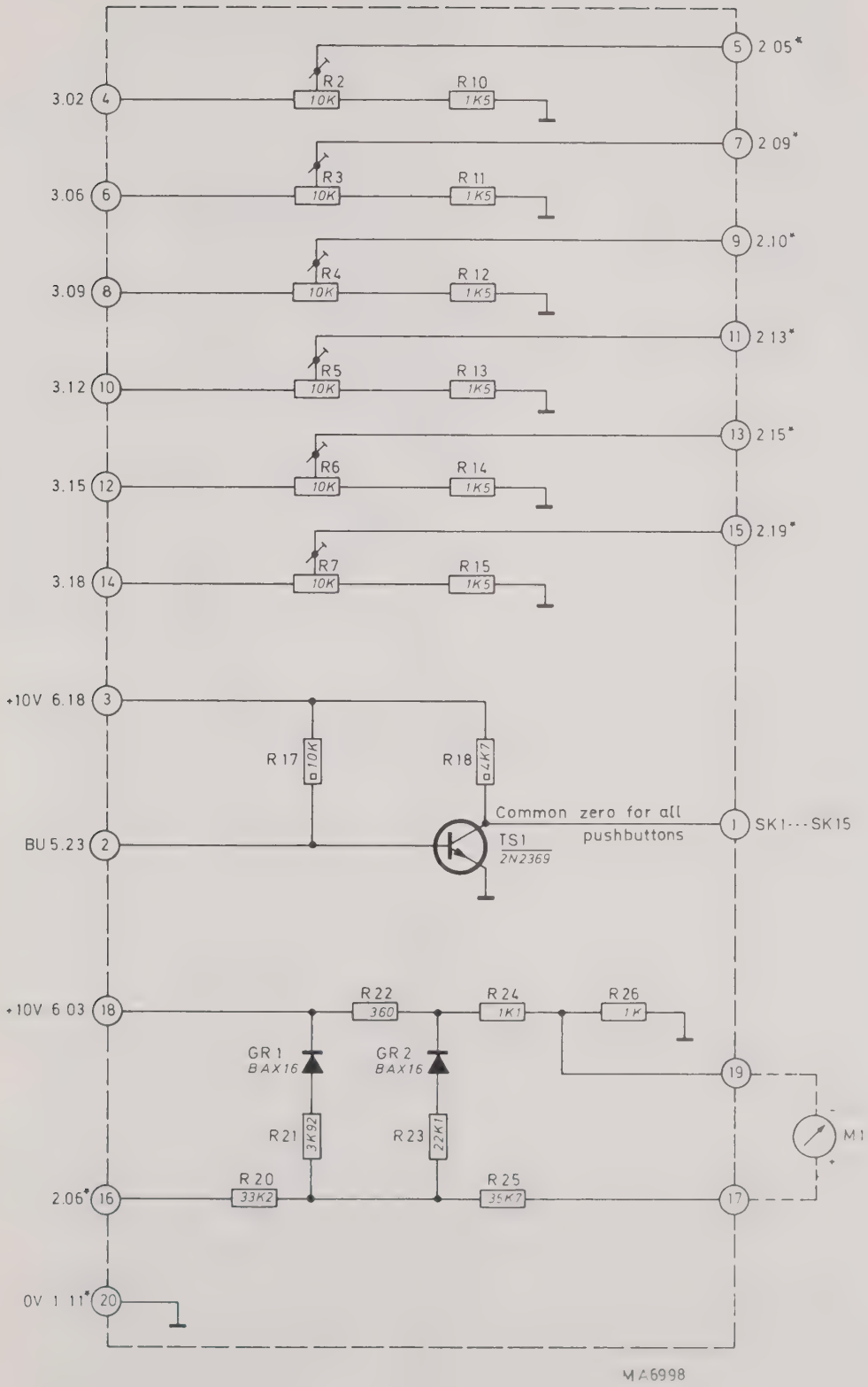


Fig. IX-6. Printed wiring board, connection board, unit 6


3.02
4
R2
10K
R10
1K5
5
2 05*
3.06
6
R3
10K
R11
1K5
7
2 09*
3.09
8
R4
10K
R12
1K5
9
2.10*
3.12
10
R5
10K
R13
1K5
11
2 13*
3.15
12
R6
10K
R14
1K5
13
2 15*
3.18
14
R7
10K
R15
1K5
15
2.19*
+10V 6.18
3
R17
10K
R18
4K7
BU 5.23
2
Common zero for all
pushbuttons
TS1
2N2369
1
SK1···SK15
+10V 6 03
18
R22
360
R24
1K1
R26
1K
GR1
BAX16
GR2
BAX16
19
R21
3K92
R23
22K1
M1
2.06*
16
R20
33K2
R25
35K7
17
0V 1 11*
20
MA6998

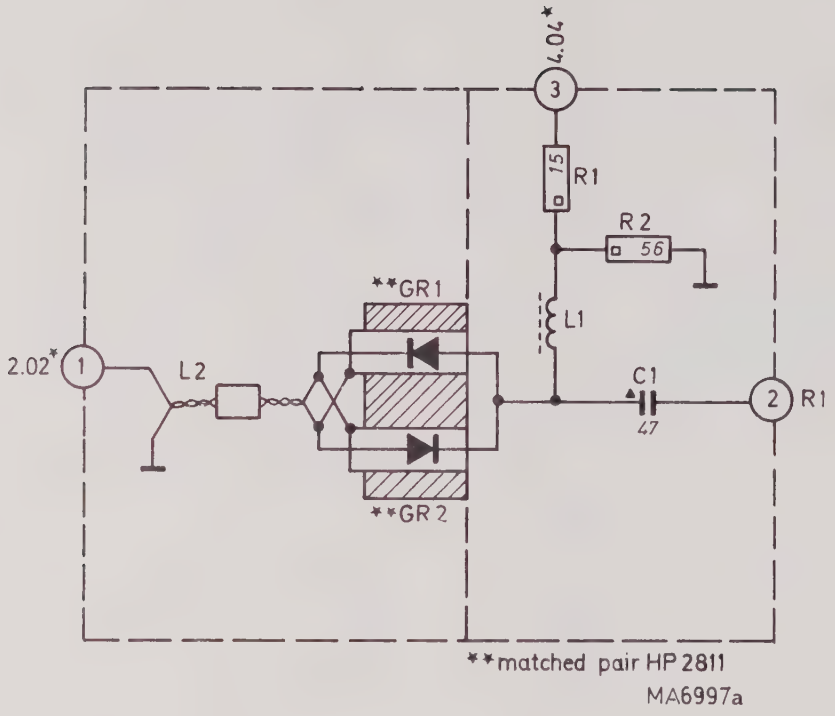


Fig. IX-7. Circuit diagram, modulator unit, unit 7

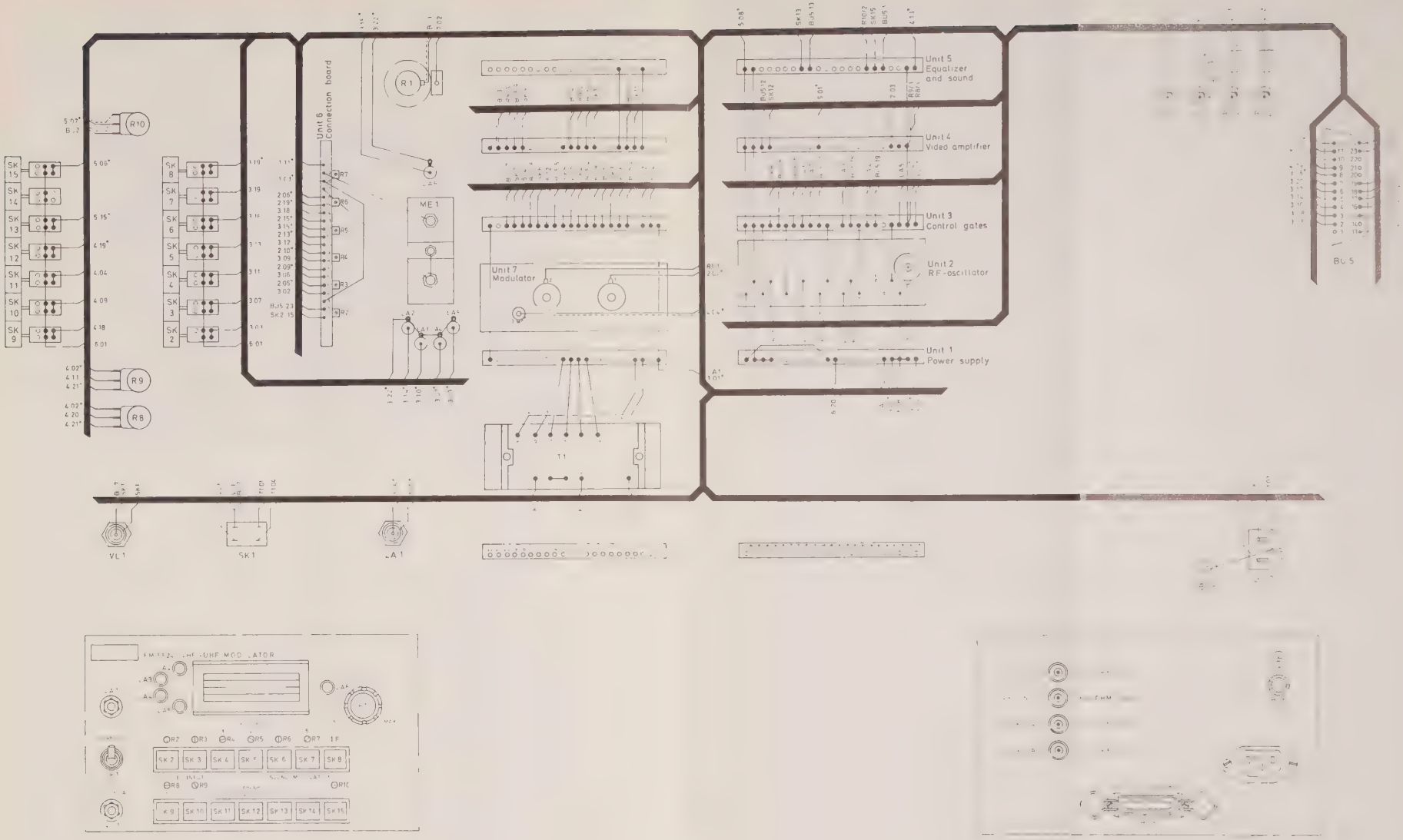


Fig. IX-8. Wiring diagram

X List of spare parts

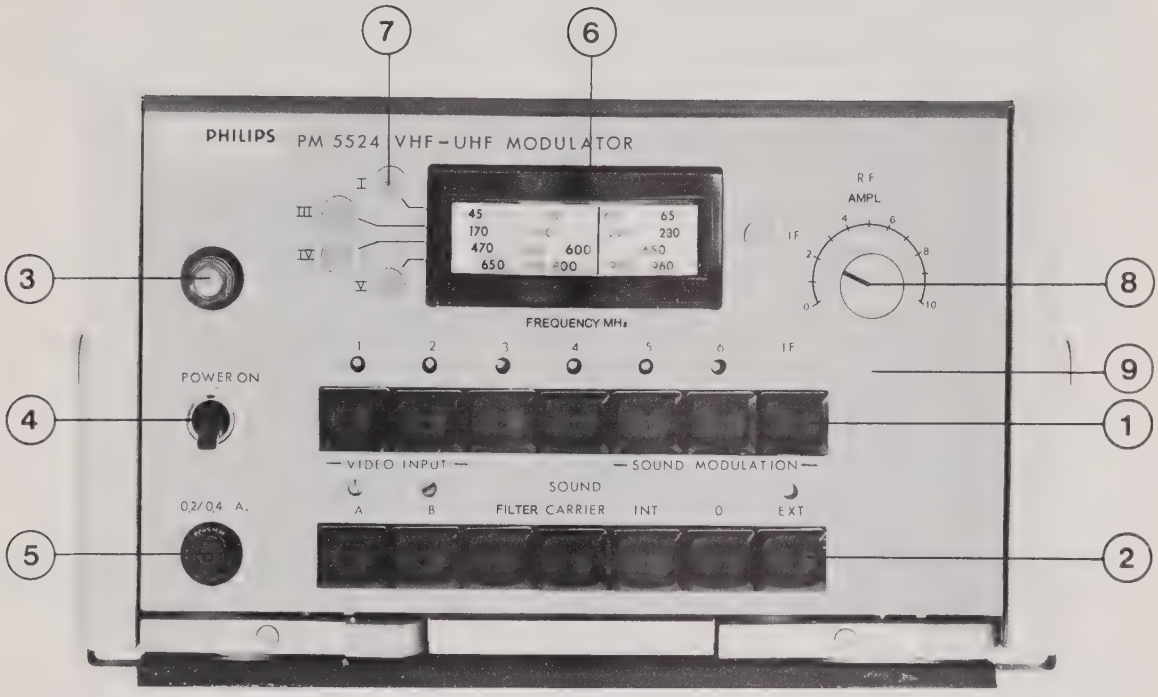


Fig. X-1. Front view

A. Mechanical

Item	Quantity	Description	Ordering number
1	1	Push button unit	4822 276 70053
2	1	Push button unit	4822 276 70052
3	1	Control lamp holder	4822 255 10078
3	1	Pilot lamp	4822 134 40264
4	1	Mains switch	4822 277 10021
5	1	Fuse holder	4822 256 40039
5	1	Fuse 230 V/T 200 mA	4822 253 30012
5	1	Fuse 115 V/T 400 mA	4822 253 30016
6	1	Frequency meter (200 μA)	4822 347 20075
7	5	Pilot lamp	4822 134 40265
8	1	Knob	4822 413 40211
8	1	Cap for knob	4822 413 70037
9	1	Textplate	4822 255 70107
	1	Mains flex	4822 321 10071
	1	Mains socket	4822 265 30066
	1	Earth connector	4822 290 40012
	4	BNC socket	4822 265 10003
	1	Multiplug	4822 267 60035
	8	Contact bloc	4822 267 60023
	8	Guide part	4822 462 30117
		Twin lead	4822 526 10084

B. ELECTRICAL — ELEKTRISCH — ELEKTRISCH — ELECTRIQUE — ELECTRICOS

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24
0,125 W 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
0,25 W ≦ 1 MΩ, 5%
> 1 MΩ, 10%

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24
0,5 W ≦ 5 MΩ, 1%
> 5 ≦ 10 MΩ, 2%
> 10 MΩ, 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
0,5 W ≦ 1,5 MΩ, 5%
> 1,5 MΩ, 10%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
10 W 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
1 W ≦ 2,2 MΩ, 5%
> 2,2 MΩ, 10%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
2 W 5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
0,4 – 1,8 W 0,5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
5,5 W ≦ 200 Ω, 10%
> 200 Ω, 5%

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular
500 V

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular
700 V

Ceramic capacitor, "pin-up"
Keramikkondensator "Pin-up" (Perltyp)
Keramische kondensator "Pin-up" type
Condensateur céramique, type perle
Condensador cerámico, versión "colgable"
500 V

"Microplate" ceramic capacitor
Miniatur-Scheibenkondensator
"Microplate" keramische kondensator
Condensateur céramique "microplate"
Condensador cerámico "microplaca"
30 V

Mica capacitor
Glimmerkondensator
Micakondensator
Condensateur au mica
Condensador de mica
500 V

Polyester capacitor
Polyesterkondensator
Polyesterkondensator
Condensateur au polyester
Condensador polyester
400 V

Flat-foil polyester capacitor
Miniatur-Polyesterkondensator (flach)
Platte miniatuur polyesterkondensator
Condensateur au polyester, type plat
Condensador polyester, tipo de placas planas
250 V

Paper capacitor
Papierkondensator
Papierkondensator
Condensateur au papier
Condensador de papel
1000 V

Wire-wound trimmer
Drahttrimmer
Draadgewonden trimmer
Trimmer à fil
Trimmer bobinado

Tubular ceramic trimmer
Rohrtrimmer
Buisvormige keramische trimmer
Trimmer céramique tubulaire
Trimmer cerámico tubular

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.
Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.
Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.
Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.
Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

Printpanels

Unit	Description	Print number	Ordering number
1	Power supply	4008 108 75820	4822 216 60197
2	RF oscillator	4008 108 75830	4822 216 60198
3	Control gates	4008 108 75840	4822 216 60199
4	Video amplifier	4008 108 75850	4822 216 60201
5	Equalizer and sound	4008 108 75860	4822 216 60202
6	Connection board	4008 108 75870	4822 216 60203
7	Modulator unit	4008 108 76070	4822 216 60204
	Extension board	4008 108 75620	4822 263 70055

Semiconductors

Type	Ordering number	Type	Ordering number
BCY72	4822 130 40486	BA182	4822 130 30644
BCY89	4822 130 30188	BAX16	4822 130 30273
BFW30	4822 130 40379	BB105B	4822 130 30661
BFW92	4822 130 40745	BY164	4822 130 30441
BFY90	4822 130 40493	BZY88/C3V9	4822 130 30411
2N930	4822 130 40051	BZY88/C4V7	4822 130 30264
2N2369	4822 130 40407	BZY88/C5V1	4822 130 30284
2N2894	4822 130 40018	BZY88/C5V6	4822 130 30193
2N2905	4822 130 40021	BZY88/C6V2	4822 130 30286
2N3055	4822 130 40132	HP2811 (matched pair)	4822 130 30697

Integrated circuits

Type	Ordering number
TAA550	4822 130 40463

Diagram number	Description	Value	Watt/Volt	Ordering number
R8, R9	Potentiometer	4.7 kΩ		4822 101 20002
R10	Potentiometer	1 kΩ		4822 101 20369
Unit 1				
C1	Electrolytic capacitor	100 µF	63 V	4822 124 20389
C2	Capacitor	4.7 kpF	125 V	4822 120 11125
C3	Capacitor	1.5 µF		4822 121 40227
C11, C21	Electrolytic capacitor	1000 µF	25 V	4822 124 20419
C12, C22	Electrolytic capacitor	20 µF	25 V	4822 124 20499
R2	Resistor	909 Ω	1 %	4822 116 50765
R4	Resistor	475 Ω	1 %	4822 116 50545
R6	Resistor	20 kΩ	1 %	4822 116 50332
R9	Resistor	22 Ω		4822 110 50063
R12	Resistor	301 Ω	1 %	4822 116 50786
R13	Resistor	3001 Ω	1 %	4822 116 50524
R14, R24	Resistor	2.7Ω	1 W	4822 113 60099
R15, R25	Potentiometer	500 Ω		4822 103 10052
R16, R26	Resistor	1000 Ω	1 %	4822 116 50573
R17, R27	Resistor	1500 Ω	1 %	4822 116 50752
R18, R28	Resistor	2430 Ω	1 %	4822 116 50157
R19, R29	Resistor	825 Ω	1 %	4822 116 50764
R20	Resistor	7500 Ω	1 %	4822 116 50151
R22	Resistor	357 Ω	1 %	4822 116 50603
R23	Resistor	3320 Ω	1 %	4822 116 50404
Unit 2				
X1	Crystal	38.9 MHz		4822 242 70171
L1	Coil			4822 156 10373
L2	Coil			4822 156 10374
L3	Coil			4822 156 10375
L4, L5	Coil			4822 158 10052
C2, C20, C23	Capacitor	2.7 pF		4822 122 40064
C3, C4, C7 C8, C11, C12	Capacitor	820 pF		4822 122 30112
C14, C15, C16 C18, C21, C22	Capacitor	820 pF		4822 122 30112
C6, C9	Capacitor	3.9 pF		4822 122 40015
C10	Capacitor	8.2 pF		4822 122 40009
C13, C19, C22	Capacitor	1 nF		4822 122 30027
R35, R39	Resistor	14 Ω		4822 111 30373
Unit 3				
C1...C11	Capacitor	3.9 kpF		4822 122 30098
Unit 4				
T1	Transformer			4822 158 10345
L1	Coil	3.9 µH		4822 156 20591
L2	Coil			4822 158 10267
L3...L7	Coil			4822 158 10052
C1, C3	Capacitor	3.9 kpF		4822 122 30098

Diagram number	Description	Value	Watt/Volt	Ordering number
C7, C19	Capacitor	3.9 kpF		4822 122 30098
C2, C4	Electrolytic capacitor	50 µF	10 V	4822 124 20501
C5, C8, C22	Electrolytic capacitor	8.2 µF	16 V	4822 124 10067
C6, C10	Capacitor	0.1 µF		4822 121 40059
C9, C16	Capacitor	1 µF		4822 121 40197
C11	Electrolytic capacitor	15 µF	10 V	4822 124 10017
C12	Capacitor	5.6 pF		4822 122 30004
C13, C18	Capacitor	68 kpF		4822 121 40057
C14	Capacitor	330 pF		4822 121 50369
C15	Capacitor	820 pF		4822 121 50368
C17	Capacitor	22 pF		4822 120 33063
C20, C21, C23 C24, C25	Electrolytic capacitor	20 µF	16 V	4822 124 20499
R8, R18	Resistor	75 Ω	1 %	4822 116 50151
R22	Resistor	1.1 kΩ	1 %	4822 116 50518
Unit 5				
L1	Coil	52 µH		4822 156 20586
L2	Coil	70 µH		4822 156 20587
L3	Coil	77 µH		4822 156 20588
L4	Coil	18 µH		4822 156 20589
L5	Coil	130 mH		4822 157 20687
L6, L7	Coil			4822 158 10052
C1	Electrolytic capacitor	20 µF	25 V	4822 124 20499
C2, C7, C8	Capacitor	18 pF	63 V	4822 122 30014
C3	Capacitor	33 pF	63 V	4822 122 30016
C4, C5, C6	Capacitor	18 pF	500 V	4822 125 50051
C6, C13	Capacitor	47 pF	63 V	4822 122 30008
C9	Capacitor	120 pF	63 V	4822 122 30093
C11	Capacitor	39 pF	63 V	4822 122 30046
C12	Capacitor	60 pF	500 V	4822 125 50057
C14	Capacitor	680 kpF	100 V	4822 121 40233
C15	Electrolytic capacitor	20 µF	16 V	4822 124 20499
C17	Capacitor	2.2 µF	100 V	4822 121 40188
C16, C18	Capacitor	0.22 µF	100 V	4822 121 40232
C19, C20	Capacitor	3.3 kpF		4822 122 30016
R4, R7, R9, R11 R16, R19, R21, R32	Potentiometer	500 Ω		4822 100 10137
R23	Potentiometer	2 kΩ		4822 100 10126
R47	Potentiometer	10 kΩ		4822 100 10035
Unit 6				
R1...R6	Potentiometer	10 kΩ		4822 101 10024
R10...R15	Resistor	1.5 kΩ	1 %	4822 116 50752
R20	Resistor	33.2 kΩ	1 %	4822 116 50482
R21	Resistor	3.92 kΩ	1 %	4822 116 50103
R22	Resistor	357 kΩ	1 %	4822 116 50603
R23	Resistor	22.1 kΩ	1 %	4822 116 50648
R24	Resistor	1.1 kΩ	1 %	4822 116 50518
R25	Resistor	35.7 kΩ	1 %	4822 116 50927
R26	Resistor	1 kΩ	1 %	4822 116 50573

Diagram number	Description	Value	Watt/Volt	Ordering number
Unit 7				
L1	Coil	1 μH		4822 158 10311
L2	Transmission line	50 Ω		4822 158 10344

XI. Print panels for the I, M and D versions

Differences for the I version

unit			
2	RF oscillators	4008 108 76871	on request
4	Video amplifier	4008 108 76881	
5	Equalizer and sound	4008 108 76891	

Differences for the M version

unit			
2	RF oscillators	4008 108 77071	on request
4	Video amplifier	4008 108 77061	
5	Equalizer and sound	4008 108 77051	

Differences for the D version

unit			
2	RF oscillators	4008 108 77031	on request
4	Video amplifier	4008 108 77041	
5	Equalizer and sound	4008 108 77081	

NB.

Units 1, 3, 6 and 7 of all versions are equal on the G version.

QUALITY REPORTING

CODING SYSTEM FOR FAILURE DESCRIPTION

The following information is meant for Philips service workshops only and serves as a guide for exact reporting of service repairs and maintenance routines on the workshop charts.
For full details reference is made to Information G1 (Introduction) and Information Cd 689 (Specific information for Test and Measuring Instruments).

LOCATION

□□□

Unit number

e.g. 000A or 0001 (for unit A or 1; not 00UA or 00U1)

or: Type number of an accessory (only if delivered with the equipment)

e.g. 9051 or 9532 (for PM 9051 or PM 9532)

or: Unknown/Not applicable

0000

CATEGORY

□

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

COMPONENT/SEQUENCE NUMBER

□□□□

Enter the identification as used in the circuit diagram, e.g.:

GR1003	Diode GR1003
TS0023	Transistor TS23
IC0101	Integrated circuit IC101
R0....	Resistor, potentiometer
C0....	Capacitor, variable capacitor
B0....	Tube, valve
LA....	Lamp
VL...	Fuse
SK....	Switch
BU....	Connector, socket, terminal
T0....	Transformer
L0....	Coil
X0....	Crystal
CB....	Circuit block
RE....	Relay
ME....	Meter, indicator
BA....	Battery
TR....	Chopper

Parts not identified in the circuit diagram:

990000	Unknown/Not applicable
990001	Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002	Knob (incl. dial knob, cap, etc.)
990003	Probe (only if attached to instrument)
990004	Leads and associated plugs
990005	Holder (valve, transistor, fuse, board, etc.)
990006	Complete unit (p.w. board, h.t. unit, etc.)
990007	Accessory (only those without type number)
990008	Documentation (manual, supplement, etc.)
990009	Foreign object
990099	Miscellaneous

Sales and service all over the world

Argentina: Philips Argentina S.A., Cassila Correo 3479, Buenos Aires; tel. T.E. 70, 7741 al 7749

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